

# LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

## Volume 5 | Technical Appendices

CFA13 | Calvert, Steeple Claydon, Twyford and Chetwode  
**Data appendix (LQ-001-013)**  
Land quality

November 2013

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Department  
for Transport

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# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Engagement</b>	<b>2</b>
<b>3</b>	<b>Detailed risk assessment</b>	<b>4</b>
3.1	Baseline risk assessment	6
3.2	Construction risk assessment	17
3.3	Post-construction risk assessment	28
3.4	Assessment of temporary (construction) and permanent (post-construction) effects	39
<b>4</b>	<b>Inspections notes and other site data</b>	<b>47</b>
<b>5</b>	<b>Geological sites of special scientific interest and local geological sites</b>	<b>50</b>
<b>6</b>	<b>Mining and minerals data</b>	<b>51</b>
<b>7</b>	<b>References</b>	<b>52</b>

## List of tables

Table 1: Engagement on land quality issues undertaken for the Calvert, Steeple Claydon, Twyford and Chetwode study area	2
Table 2: Sites included in the detailed risk assessment within the Calvert, Steeple Claydon, Twyford and Chetwode study area	4
Table 3: Baseline CSM and qualitative risk assessment – Calvert landfill Pits 4 and 5 (Ref ID 13-1)	6
Table 4: Baseline CSM and qualitative risk assessment – Aylesbury Link railway adjacent to the Proposed Scheme (Ref ID 13-2)	7
Table 5: Baseline CSM and qualitative risk assessment – former Calvert Brickworks (Ref ID 13-3)	9
Table 6: Baseline CSM and qualitative risk assessment – sewage works (Ref ID 13-6)	9
Table 7: Baseline CSM and qualitative risk assessment – dismantled Rugby to Quainton Great Central Railway adjacent to the route (Ref ID 13-7)	10
Table 8: Baseline CSM and qualitative risk assessment – Calvert landfill Pit 1 (Ref ID 13-8)	12
Table 9: Baseline CSM and qualitative risk assessment – historical Buckingham Rural District Council refuse tip (Calvert Jubilee Nature Reserve) (Ref ID 13-9)	13
Table 10: Baseline CSM and qualitative risk assessment – historical Aylesbury Borough Council refuse tip (Ref ID 13-10)	14
Table 11: Baseline CSM and qualitative risk assessment –airfield (formerly RAF Finmere) (Ref ID 13-11)	15
Table 12: Construction CSM and qualitative risk assessment – Calvert landfill Pits 4 and 5 (Ref ID 13-1)	17
Table 13: Construction CSM and qualitative risk assessment – Aylesbury Link railway adjacent to the Proposed Scheme (Ref ID 13-2)	18
Table 14: Construction CSM and qualitative risk assessment – former Calvert Brickworks (Ref ID 13-3)	20
Table 15: Construction CSM and qualitative risk assessment – sewage works (Ref ID 13-6)	20
Table 16: Construction CSM and qualitative risk assessment – dismantled Rugby to Quainton Great Central Railway adjacent to the route (Ref ID 13-7)	21
Table 17: Construction CSM and qualitative risk assessment – Calvert landfill Pit 1 (Ref ID 13-8)	23
Table 18: Construction CSM and qualitative risk assessment – historical Buckingham Rural District Council refuse tip (Calvert Jubilee Nature Reserve) (Ref ID 13-9)	24
Table 19: Construction CSM and qualitative risk assessment – historical Aylesbury Borough Council refuse tip (Ref ID 13-10)	25
Table 20: Construction CSM and qualitative risk assessment –airfield (formerly RAF Finmere) (Ref ID 13-11)	26
Table 21: Post-Construction CSM and qualitative risk assessment – Calvert landfill Pits 4 and 5 (Ref ID 13-1)	28
Table 22: Post-Construction CSM and qualitative risk assessment – Aylesbury Link railway adjacent to the Proposed Scheme (Ref ID 13-2)	29
Table 23: Post-Construction CSM and qualitative risk assessment – former Calvert Brickworks (Ref ID 13-3)	31
Table 24: Post Construction CSM and qualitative risk assessment – sewage works (Ref ID 13-6)	31
Table 25: Post-Construction CSM and qualitative risk assessment – dismantled Rugby to Quainton Great Central Railway adjacent to the route (Ref ID 13-7)	32
Table 26: Post-Construction CSM and qualitative risk assessment – Calvert landfill Pit 1 (Ref ID 13-8)	33

Table 27: Post-Construction CSM and qualitative risk assessment – historical Buckingham Rural District Council refuse tip (Calvert Jubilee Nature Reserve) (Ref ID 13-9)	35
Table 28: Post-Construction CSM and qualitative risk assessment – historical Aylesbury Borough Council refuse tip (Ref ID 13-10)	36
Table 29: Post Construction CSM and qualitative risk assessment –airfield (formerly RAF Finmere) (Ref ID 13-11)	37
Table 30: Significance of impact during construction and post construction – Calvert landfill Pits 4 and 5 (Ref ID 13-1)	39
Table 31: Significance of impact during construction and post construction – Aylesbury Link railway adjacent to the Proposed Scheme (Ref ID 13-2)	40
Table 32: Significance of impact during construction and post construction – former Calvert Brickworks (Ref ID 13-3)	41
Table 33: Significance of impact during construction and post construction – sewage works (Ref ID 13-6)	41
Table 34: Significance of impact during construction and post construction – dismantled Rugby to Quainton Great Central Railway adjacent to the route (Ref ID 13-7)	42
Table 35: Significance of impact during construction and post construction – Calvert landfill Pit 1 (Ref ID 13-8)	43
Table 36: Significance of impact during construction and post construction – historical Buckingham Rural District Council refuse tip (Calvert Jubilee Nature Reserve) (Ref ID 13-9)	44
Table 37: Significance of impact during construction and post construction – historical Aylesbury Borough Council refuse tip (Ref ID 13-10)	45
Table 38: Significance of impact during construction and post construction – airfield (formerly RAF Finmere) (Ref ID 13-11)	46
Table 39: Site inspection notes from Area ref 13-1	47
Table 40: Site inspection data from Area ref 13-8	48
Table 41: Site relevant data - Ground investigation and contaminant survey reports	48

# 1 Introduction

1.1.1 The land quality appendix for the Calvert, Steeple Claydon, Twyford and Chetwode community forum area (CFA<sub>13</sub>) comprises:

- a summary of engagement undertaken (Section 2);
- detailed risk assessment (Section 1);
- inspection notes and other site data (Section 4);
- geological sites of special scientific interest (SSSI) and local geological sites (LGS) (Section 5); and
- mining and minerals data (Section 5.1.1).

1.1.2 Maps referred to throughout the land quality appendix are contained in Maps LQ-01-028 to 031 in Volume 5, Land Quality Map Book.

## 2 Engagement

- 2.1.1 Table 1 sets out the local authorities and other organisations that have been engaged with during the preparation of the land quality section of the environmental impact assessment (EIA) for this study area, the types of information that have been provided to the assessment team and any specific concerns of those with whom the team engaged.

Table 1: Engagement on land quality issues undertaken for the Calvert, Steeple Claydon, Twyford and Chetwode study area

Local authority or other organisation	Method/dates of contact	Information provided and/or specific concerns
Aylesbury Vale District Council (AVDC)	Contact via email on: 28 November 2012; 10 December 2012; and 8 February 2013.  Contact via telephone on: 6 February 2013.	AVDC supplied the requested data regarding locations of potentially contaminated land within 1km of the route in a geographical information system (GIS) shapefile format.
Buckinghamshire County Council (BuCC)	Contact via email on: 28 November 2012; 3 December 2012; 21 December 2012; 2 January 2013; 23 January 2013; 1 February 2013; 9 February 2013; and 2 May 2013.	Initial email regarding detailed mineral areas for assessing sterilisation of resources and requesting landfill data to provide more detail on what has already been received to assess contamination potential.  BuCC responded with the data requested regarding minerals and waste sites, as well as links to the minerals safeguarding area (MSA) on the BuCC website.  BuCC also supplied GIS data showing MSA, preferred areas and landfill data and confirmed it does not have a designated petroleum officer or hold any information on underground storage tanks (UST).
Cherwell District Council (CDC)	Contact via email on: 28 September 2012; 13 December 2012; 6 February 2013; 7 February 2013; and 14 February 2013.	CDC supplied the requested EIA information, including specific planning policies and guidance relating to contaminated land and for information on any sites in the vicinity of the route with potential land contamination or with possible contaminative history. CDC supplied a screen shot of the disused railway near Mixbury to further define the area under inspection.
Oxfordshire County Council (OCC)	Contact via email on: 29 October 2012; 8 January 2013; 21 February 2013; and 18 March 2013.	OCC supplied requested data regarding mineral areas for assessing sterilisation of resources and landfill data with a GIS layer in a MapInfo format.



Local authority or other organisation	Method/dates of contact	Information provided and/or specific concerns
Environment Agency	Contact via email on: 24 April 2013;  15 May 2013;  24 May 2013;  12 June 2013;  14 June 2013;  27 June 2013; and  8 July 2013.	The Environment Agency has been contacted to supply information on landfills within the study area - data outstanding at the time of production of this report.
Ministry of Defence (MoD)	Contact on unspecified date.	Requests for information on Royal Air Force (RAF) sites in the study area have been made. No information has been received at time of producing this report.

### 3 Detailed risk assessment

- 3.1.1 This appendix presents assessments for areas potentially posing a contaminative risk for the Proposed Scheme within the study area. For each site the following data are presented:
- baseline risk assessment;
  - construction risk assessment;
  - post-construction risk assessment; and
  - assessment of temporary (construction) and permanent (post-construction) effects.
- 3.1.2 This risk assessment incorporates the following assumptions:
- construction workers are not included as part of this assessment;
  - sites that have been assessed as potentially posing a contaminative risk to the Proposed Scheme have been grouped and considered together where appropriate. It should be noted that some parcels of land may have had several land uses from different epochs;
  - during construction standard mitigation procedures will be in place in accordance with the draft Code of Construction Practice (CoCP) (Volume 5: Appendix CT-003-000); and
  - during the post-construction condition it is assumed that all required remediation has been undertaken and carried out.
- 3.1.3 The sites assessed in this study area are shown on the Maps LQ-01-028 to 031 (Volume 5, Land Quality Map Book).

Table 2: Sites included in the detailed risk assessment within the Calvert, Steeple Claydon, Twyford and Chetwode study area

Area reference	Area name	Table numbers
13-1	Calvert landfill Pits 4 and 5	3, 12, 21, 30
13-2	Aylesbury Link railway adjacent to the Proposed Scheme	4, 13, 22, 31
13-3	Former Calvert brickworks	5, 14, 23, 32
13-6	Sewage works	6, 15, 24, 33
13-7	Dismantled Rugby to Quainton Great Central Railway adjacent to route	7, 16, 25, 34
13-8	Calvert landfill Pit 1	8, 17, 26, 35
13-9	Historical Buckingham Rural District Council refuse tip	9, 18, 27, 36
13-10	Historical Aylesbury Borough Council refuse tip	10, 19, 28, 37
13-11	Airfield (formerly RAF Finmere)	11, 20, 29, 38

- 3.1.4 Contaminant types included within the risk assessments are based on the Priority Contaminants Report CLR 8<sup>1</sup>. Although withdrawn, this document is still commonly used and is considered good practice.
- 3.1.5 The remainder of this section presents the risk assessment for the sites set out in Table 2. The following acronyms are used in these tables:
- CSM - conceptual site model;
  - LWS - local wildlife site;
  - SSSI - site of special scientific interest; and
  - VOC - volatile organic compounds.

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<sup>1</sup> Defra and Environment Agency, (2002), *Potential contaminants for the assessment of land- R&D Publication*, Bristol, Environment Agency.

### 3.1 Baseline risk assessment

Table 3: Baseline CSM and qualitative risk assessment – Calvert landfill Pits 4 and 5 (Ref ID 13-1)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Calvert landfill Pits 4 and 5  Contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Sensitive land use  On-site employees	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Sensitive land use  Adjacent housing (Calvert Green)	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Ecological  Sheephouse Wood SSSI  Decoy Pond Wood LWS	Lateral migration of contaminated groundwater/leachate and surface run-off	Low likelihood	Minor	Low
		Contact with windblown dusts	Low likelihood	Minor	Low

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
	Property On-site buildings	Concentration of asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Low likelihood	Minor	Low
	Property Adjacent housing (Calvert Green) Adjacent sports ground buildings	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Severe	Moderate
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Minor	Very low

Table 4: Baseline CSM and qualitative risk assessment – Aylesbury Link railway adjacent to the Proposed Scheme (Ref ID 13-2)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Residual contamination in made ground (e.g. ballast) including heavy metals, oils and asbestos. Low levels of ground gas (methane, carbon dioxide and VOC) in areas of potential landfilling	Sensitive land use	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
	Adjacent housing (Werner Terrace and Shepherd's Furze Farm)				
	Adjacent Calvert landfill employees Housing within 50m (Werner	Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
	Terrace)	Exposure to asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	Ecological Sheephouse Wood SSSI Decoy Pond Wood LWS	Lateral migration of contaminated groundwater, through culverts and surface run-off	Low likelihood	Minor	Low
	Calvert Jubilee LWS and nature reserve at Calvert Jubilee Calvert Brick Pits, Great Moor Sailing Club LWS	Contact with windblown dusts	Unlikely	Minor	Very low
	Property Adjacent housing (Werner Terrace and Shepherd's Furze Farm)	Lateral migration and concentration of asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	Housing within 50m (Werner Terrace) Adjacent buildings (current Calvert landfill)	Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 5: Baseline CSM and qualitative risk assessment – former Calvert Brickworks (Ref ID 13-3)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Former brickwork manufacturing area (now Calvert Green housing estate)  Not likely to have been quarried or landfilled, therefore contaminants that could be present include, for example, fuels and oils associated with machinery	Sensitive land use  Housing estate on-site (Calvert Green)	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
	Property  Housing on-site (Calvert Green)  Adjacent sports ground buildings	Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 6: Baseline CSM and qualitative risk assessment – sewage works (Ref ID 13-6)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Heavy metals, organic compounds e.g. oils, pathogens from sludge which may have been spreading on surrounding land. Also methane, carbon dioxide and VOC if sludge was buried	Sensitive land use  On-site sewage works employees  Housing within 50m (farm)  Workers within 50m (farm)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Low likelihood	Severe	Moderate
	Controlled waters	Vertical and lateral migration of contaminated	Low likelihood	Minor	Low

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
	Secondary A River Terrace Deposits aquifer at surface	groundwater			
	Property On-site buildings Farm buildings within 50m	Concentration of asphyxiative or explosive gases	Low likelihood	Severe	Moderate
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 7: Baseline CSM and qualitative risk assessment – dismantled Rugby to Quainton Great Central Railway adjacent to the route (Ref ID 13-7)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Disused railway adjacent to the route. Distance varies from immediately adjacent to within 50m250m  Residual contamination in made ground (e.g. ballast) including heavy metals, oils and asbestos. Low levels of ground gas (methane, carbon dioxide and VOC) in areas of potential landfilling	Sensitive land use	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Unlikely	Moderate	Low
	Adjacent housing (Manthorn Farm)				
	Housing within 50m (Church View Farm)	Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	Controlled waters	Vertical and lateral migration of contaminated groundwater	Low likelihood	Minor	Low
	Secondary A alluvium aquifer at surface in locations particularly towards the south and centre of site 13-7				
	Secondary A Kellaways Formation	Surface run-off	Low likelihood	Minor	Low



Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
	aquifer at surface at the northern end of Area ref 13-7				
	Ecological Calvert Jubilee LWS and nature reserve at Calvert Jubilee	Lateral migration of contaminated groundwater and surface run-off	Low likelihood	Minor	Low
	Barton Hartshorn Railway Wood LWS	Contact with windblown dusts	Unlikely	Minor	Very low
	Property Adjacent housing (Manthorn Farm) Housing within 50m (Church View Farm)	Lateral migration and concentration of asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

## Appendix LQ-001-013

Table 8: Baseline CSM and qualitative risk assessment – Calvert landfill Pit 1 (Ref ID 13-8)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
<p>Historical landfill recorded as having accepted inert, industrial, commercial and household waste</p> <p>Contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)</p>	<p>Sensitive land use</p> <p>Housing on-site</p>	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	<p>Sensitive land use</p> <p>Adjacent housing estate (Calvert Green) (to the south-east)</p> <p>Adjacent housing (to the north-east)</p>	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Unlikely	Moderate	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	<p>Ecological</p> <p>Calvert Jubilee LWS and nature reserve at Calvert Jubilee</p> <p>Calvert Brick Pits, Great Moor Sailing Club LWS</p>	Lateral migration of contaminated groundwater and surface run-off	Low likelihood	Minor	Low
		Contact with windblown dusts	Unlikely	Minor	Very low
	<p>Property</p> <p>Housing on-site</p>	Lateral migration and concentration of asphyxiative or explosive	Low likelihood	Moderate	Moderate/low

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
		gases			
	Property Adjacent housing estate (Calvert Green) (to the south-east)	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Adjacent housing (to the north-east)	Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 9: Baseline CSM and qualitative risk assessment – historical Buckingham Rural District Council refuse tip (Calvert Jubilee Nature Reserve) (Ref ID 13-9)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
<p>Historical council landfill recorded as having accepted industrial and commercial waste (now a lake and nature reserve)</p> <p>Contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)</p>	<p>Sensitive land use</p> <p>Adjacent housing (to the south-east)</p>	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Unlikely	Moderate	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	<p>Ecological</p> <p>Calvert Jubilee LWS and nature reserve at Calvert Jubilee (on-site)</p>	Contaminated surface water within lake	Likely	Minor	Moderate/low
		Contact with windblown dusts	Unlikely	Minor	Very low

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
	Property Adjacent housing (to the south-east)	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 10: Baseline CSM and qualitative risk assessment – historical Aylesbury Borough Council refuse tip (Ref ID 13-10)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Historical council landfill recorded to have accepted commercial waste (now Grebe Lake)  Contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Sensitive land use  On-site sailing club employees	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	Sensitive land use  Housing within 50m (to the south-east)	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Unlikely	Moderate	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or	Low likelihood	Moderate	Moderate/low

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
		explosive gases			
	Ecological	Contaminated surface water within lake	Likely	Minor	Moderate/low
	Calvert Brick Pits, Great Moor Sailing Club LWS (on-site)	Contact with windblown dusts	Unlikely	Minor	Very low
	Property	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Housing within 50m (to the south-east) On-site sailing club	Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 11: Baseline CSM and qualitative risk assessment –airfield (formerly RAF Finmere) (Ref ID 13-11)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Contaminants that could be present include, but are not limited to: fuels and oils, degreasants, paints, anti-freeze/de-icers (e.g. glycols), fire-fighting foams, cleaning agents, asbestos, explosives	Sensitive land use	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Moderate	Moderate/low
	Housing on-site (including farms)				
	Commercial premises on-site (including arable centre, animal feed mill and aerodrome)	Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
	Adjacent housing and commercial properties within 50m	Exposure to asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
	Controlled waters  Largely unproductive strata at surface  Secondary A and undifferentiated glaciofluvial deposits and Kellaways Formation aquifers at surface in strip from centre of southern perimeter and south-western corner of Area ref 13-11	Vertical and lateral migration of contaminated groundwater	Low likelihood	Minor	Low
	Ecological  West Wood LWS (on-site)	Lateral migration of contaminated groundwater and surface run-off	Low likelihood	Minor	Low
	Tingewick Meadows SSSI (partly on-site)	Contact with windblown dusts	Low likelihood	Minor	Low
	Property  Housing on-site (including farms)  Commercial premises on-site (including arable centre, animal feed mill and aerodrome)	Lateral migration and concentration of asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Adjacent housing and commercial properties within 50m	Direct contact of below ground building structures and services with contaminated groundwater/soil	Low likelihood	Minor	Low

## 3.2 Construction risk assessment

Table 12: Construction CSM and qualitative risk assessment – Calvert landfill Pits 4 and 5 (Ref ID 13-1)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Calvert landfill Pits 4 and 5  Contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Sensitive land use  On-site employees	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Sensitive land use  Adjacent housing (Calvert Green)	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Ecological  Sheephouse Wood SSSI  Decoy Pond Wood LWS	Lateral migration of contaminated groundwater/leachate and surface run-off	Low likelihood	Minor	Low
		Contact with windblown dusts	Low likelihood	Minor	Low
	Property	Concentration of asphyxiative or explosive	Low likelihood	Moderate	Moderate/low

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
	On-site buildings	gases			
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Low likelihood	Minor	Low
	Property Adjacent housing (Calvert Green) Adjacent sports ground buildings	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Severe	Moderate
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Minor	Very low

Table 13: Construction CSM and qualitative risk assessment – Aylesbury Link railway adjacent to the Proposed Scheme (Ref ID 13-2)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Residual contamination in made ground (e.g. ballast) including heavy metals, oils and asbestos. Low levels of ground gas (methane, carbon dioxide and VOC) in areas of potential landfilling	Sensitive land use	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
	Housing within 50m (Werner Terrace)				
	Adjacent Calvert landfill employees	Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
	(Adjacent housing scheduled for demolition (parts of Werner Terrace and Shepherd's Furze Farm))	Exposure to asphyxiative or explosive gases	Unlikely	Severe	Moderate/low



Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
	Ecological	Lateral migration of contaminated groundwater, through culverts and surface run-off	Low likelihood	Minor	Low
	Sheephouse Wood SSSI				
	Decoy Pond Wood LWS	Contact with windblown dusts	Unlikely	Minor	Very low
	Calvert Jubilee LWS and nature reserve at Calvert Jubilee				
	Calvert Brick Pits, Great Moor Sailing Club LWS				
	Property	Lateral migration and concentration of asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	Housing within 50m (Werner Terrace)				
	(Adjacent housing scheduled for demolition (parts of Werner Terrace and Shepherd's Furze Farm))	Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low
	Adjacent buildings (current Calvert landfill)				

## Appendix LQ-001-013

Table 14: Construction CSM and qualitative risk assessment – former Calvert Brickworks (Ref ID 13-3)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Former brickwork manufacturing area (now Calvert Green housing estate)  Not likely to have been quarried or landfilled, therefore contaminants that could be present include, for example, fuels and oils associated with machinery	Sensitive land use  Housing estate on-site (Calvert Green)	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
	Property  Housing on-site (Calvert Green)  Adjacent sports ground buildings	Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 15: Construction CSM and qualitative risk assessment – sewage works (Ref ID 13-6)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Heavy metals, organic compounds e.g. oils, pathogens from sludge which may have been spreading on surrounding land. Also methane, carbon dioxide and VOC if sludge was buried	Sensitive land use  On-site sewage works employees  Housing within 50m (farm)  Workers within 50m (farm)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Low likelihood	Severe	Moderate
	Controlled waters  Secondary A River Terrace	Vertical and lateral migration of contaminated groundwater	Low likelihood	Minor	Low

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
	Deposits aquifer at surface				
	Property On-site buildings Farm buildings within 50m	Concentration of asphyxiative or explosive gases	Low likelihood	Severe	Moderate
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 16: Construction CSM and qualitative risk assessment – dismantled Rugby to Quainton Great Central Railway adjacent to the route (Ref ID 13-7)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Disused railway adjacent to the route. Distance varies from immediately adjacent to within 50m250m  Residual contamination in made ground (e.g. ballast) including heavy metals, oils and asbestos. Low levels of ground gas (methane, carbon dioxide and VOC) in areas of potential landfilling	Sensitive land use  (Adjacent housing (Manthorn Farm) scheduled for demolition)	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Unlikely	Moderate	Low
	Housing within 50m (Church View Farm)	Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	Controlled waters  Secondary A alluvium aquifer at surface in locations particularly towards the south and centre of Area ref 13-7	Vertical and lateral migration of contaminated groundwater	Low likelihood	Minor	Low
	Secondary A Kellaways Formation	Surface run-off	Low likelihood	Minor	Low

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
	aquifer at surface at the northern end of Area ref 13-7				
	Ecological Calvert Jubilee LWS and nature reserve at Calvert Jubilee	Lateral migration of contaminated groundwater and surface run-off	Low likelihood	Minor	Low
	Barton Hartshorn Railway Wood LWS	Contact with windblown dusts	Unlikely	Minor	Very low
	Property (Adjacent housing (Manthorn Farm) scheduled for demolition)	Lateral migration and concentration of asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	Housing within 50m (Church View Farm)	Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 17: Construction CSM and qualitative risk assessment – Calvert landfill Pit 1 (Ref ID 13-8)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Historical landfill recorded as having accepted inert, industrial, commercial and household waste  Contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Sensitive land use  Housing on-site	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Sensitive land use  Adjacent housing estate (Calvert Green) (to the south-east)  Adjacent housing (to the north-east)	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Unlikely	Moderate	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Ecological  Calvert Jubilee LWS and nature reserve at Calvert Jubilee  Calvert Brick Pits, Great Moor Sailing Club LWS	Lateral migration of contaminated groundwater and surface run-off	Low likelihood	Minor	Low
		Contact with windblown dusts	Unlikely	Minor	Very low
	Property  Housing on-site	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
	Property Adjacent housing estate (Calvert Green) (to the south-east)	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Adjacent housing (to the north-east)	Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 18: Construction CSM and qualitative risk assessment – historical Buckingham Rural District Council refuse tip (Calvert Jubilee Nature Reserve) (Ref ID 13-9)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
<p>Historical council landfill recorded as having accepted industrial and commercial waste (now a lake and nature reserve)</p> <p>Contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)</p>	<p>Sensitive land use</p> <p>Adjacent housing (to the south-east)</p>	<p>Inhalation/ingestion of or dermal contact with contaminated soils/dust</p> <p>None (housing scheduled for demolition)</p>	No contaminant linkage	No contaminant linkage	None
		<p>Inhalation of vapours derived from contaminated groundwater/soil</p> <p>None (housing scheduled for demolition)</p>	No contaminant linkage	No contaminant linkage	None
		<p>Exposure to asphyxiative or explosive gases</p> <p>None (housing scheduled for demolition)</p>	No contaminant linkage	No contaminant linkage	None

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
	Ecological  Calvert Jubilee LWS and nature reserve at Calvert Jubilee (on-site)	Contaminated surface water within lake	Likely	Minor	Moderate/low
		Contact with windblown dusts	Unlikely	Minor	Very low
	Property  Adjacent housing (to the south-east)	Lateral migration and concentration of asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
		Direct contact of below ground building structures and services with contaminated groundwater/soil	No contaminant linkage	No contaminant linkage	None

Table 19: Construction CSM and qualitative risk assessment – historical Aylesbury Borough Council refuse tip (Ref ID 13-10)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Historical council landfill recorded to have accepted commercial waste (now Grebe Lake)  Contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Sensitive land use  On-site sailing club employees	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	Sensitive land use	Inhalation/ingestion of or dermal contact with	Unlikely	Moderate	Low

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
	Housing within 50m (to the south-east)	contaminated soils/dust			
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Ecological  Calvert Brick Pits, Great Moor Sailing Club LWS (on-site)	Contaminated surface water within lake	Likely	Minor	Moderate/low
		Contact with windblown dusts	Unlikely	Minor	Very low
	Property  Housing within 50m(to the south-east)  On-site sailing club	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 20: Construction CSM and qualitative risk assessment –airfield (formerly RAF Finmere) (Ref ID 13-11)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Contaminants that could be present include, but are not limited to: fuels and oils, degreasants, paints, anti-freeze/de-icers (e.g. glycols), fire-fighting foams, cleaning agents, asbestos,	Sensitive land use  Housing on-site (including farms)  Commercial premises on-site	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Moderate	Moderate/low



Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
explosives	(including arable centre, animal feed mill and aerodrome)	Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
	Adjacent housing and commercial properties within 50m	Exposure to asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Controlled waters	Vertical and lateral migration of contaminated groundwater	Low likelihood	Minor	Low
	Largely unproductive strata at surface				
	Secondary A and undifferentiated glaciofluvial deposits and Kellaways Formation aquifers at surface in strip from centre of southern perimeter and south-western corner of Area ref 13-11				
	Ecological	Lateral migration of contaminated groundwater and surface run-off	Low likelihood	Minor	Low
	West Wood LWS (on-site)				
	Tingewick Meadows SSSI (partly on-site)	Contact with windblown dusts	Low likelihood	Minor	Low
	Property	Lateral migration and concentration of asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Housing on-site (including farms)				
	Commercial premises on-site (including arable centre, animal feed mill and aerodrome)	Direct contact of below ground building structures and services with contaminated groundwater/soil	Low likelihood	Minor	Low
	Adjacent housing and commercial properties within 50m				

### 3.3 Post-construction risk assessment

Table 21: Post-Construction CSM and qualitative risk assessment – Calvert landfill Pits 4 and 5 (Ref ID 13-1)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Calvert landfill Pits 4 and 5  Contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Sensitive land use  On-site employees	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Sensitive land use  Adjacent housing (Calvert Green)	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Ecological  Sheephouse Wood SSSI  Decoy Pond Wood LWS	Lateral migration of contaminated groundwater/leachate and surface run-off	Unlikely	Minor	Very Low
		Contact with windblown dusts	Low likelihood	Minor	Low
	Property	Concentration of	Low likelihood	Moderate	Moderate/low

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
	On-site buildings	asphyxiative or explosive gases			
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Low likelihood	Minor	Low
	Property Adjacent housing (Calvert Green) Adjacent sports ground buildings	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Severe	Moderate
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Minor	Very low

Table 22: Post-Construction CSM and qualitative risk assessment – Aylesbury Link railway adjacent to the Proposed Scheme (Ref ID 13-2)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Residual contamination in made ground (e.g. ballast) including heavy metals, oils and asbestos. Low levels of ground gas (methane, carbon dioxide and VOC) in areas of potential landfilling	Sensitive land use	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
	Housing within 50m (Werner Terrace)				
	Adjacent Calvert landfill employees	Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
	(Adjacent housing scheduled for demolition (parts of Werner Terrace and Shepherd's Furze	Exposure to asphyxiative or	Unlikely	Severe	Moderate/low

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
	Farm))	explosive gases			
	Ecological Sheephouse Wood SSSI Decoy Pond Wood LWS	Lateral migration of contaminated groundwater, through culverts and surface run-off	Unlikely	Minor	Very low
	Calvert Jubilee LWS and nature reserve at Calvert Jubilee Calvert Brick Pits, Great Moor Sailing Club LWS	Contact with windblown dusts	Unlikely	Minor	Very low
	Property Housing within 50m Werner Terrace)	Lateral migration and concentration of asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	(Adjacent housing scheduled for demolition (parts of Werner Terrace and Shepherd's Furze Farm))	Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low
	Adjacent buildings (current Calvert landfill)				

Table 23: Post-Construction CSM and qualitative risk assessment – former Calvert Brickworks (Ref ID 13-3)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Former brickwork manufacturing area (now Calvert Green housing estate)  Not likely to have been quarried or landfilled, therefore contaminants that could be present include, for example, fuels and oils associated with machinery	Sensitive land use  Housing estate on-site (Calvert Green)	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
	Property  Housing on-site (Calvert Green)  Adjacent sports ground buildings	Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 24: Post Construction CSM and qualitative risk assessment – sewage works (Ref ID 13-6)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Heavy metals, organic compounds e.g. oils, pathogens from sludge which may have been spreading on surrounding land. Also methane, carbon dioxide and VOC if sludge was buried	Sensitive land use  On-site sewage works employees  Housing within 50m (farm)  Workers within 50m (farm)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Low likelihood	Severe	Moderate
	Controlled waters  Secondary A River Terrace	Vertical and lateral migration of contaminated	Low likelihood	Minor	Low

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
	Deposits aquifer at surface	groundwater			
	Property On-site buildings Farm buildings within 50m	Concentration of asphyxiative or explosive gases	Low likelihood	Severe	Moderate
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 25: Post-Construction CSM and qualitative risk assessment – dismantled Rugby to Quanton Great Central Railway adjacent to the route (Ref ID 13-7)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Disused railway adjacent to the route. Distance varies from immediately adjacent to within 50m250m  Residual contamination in made ground (e.g. ballast) including heavy metals, oils and asbestos. Low levels of ground gas (methane, carbon dioxide and VOC) in areas of potential landfilling	Sensitive land use  (Adjacent housing (Manthorn Farm) scheduled for demolition)  Housing within 50m (Church View Farm)	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Unlikely	Moderate	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	Controlled waters  Secondary A alluvium aquifer at surface in locations particularly towards the south and centre of Area ref 13-7  Secondary A Kellaways Formation aquifer at surface at the northern	Vertical and lateral migration of contaminated groundwater	Low likelihood	Minor	Low
		Surface run-off	Low likelihood	Minor	Low

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
	end of Area ref 13-7				
	Ecological Calvert Jubilee LWS and nature reserve at Calvert Jubilee	Lateral migration of contaminated groundwater and surface run-off	Low likelihood	Minor	Low
	Barton Hartshorn Railway Wood LWS	Contact with windblown dusts	Unlikely	Minor	Very low
	Property (Adjacent housing (Manthorn Farm) scheduled for demolition)	Lateral migration and concentration of asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	Housing within 50m (Church View Farm)	Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 26: Post-Construction CSM and qualitative risk assessment – Calvert landfill Pit 1 (Ref ID 13-8)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Historical landfill recorded as having accepted inert, industrial, commercial and household waste  Contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Sensitive land use Housing on-site	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
	Sensitive land use	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Unlikely	Moderate	Low
	Adjacent housing estate (Calvert Green) (to the south-east)				
	Adjacent housing (to the north-east)	Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Ecological				
	Calvert Jubilee LWS and nature reserve at Calvert Jubilee	Lateral migration of contaminated groundwater and surface run-off	Low likelihood	Minor	Low
	Calvert Brick Pits, Great Moor Sailing Club LWS	Contact with windblown dusts	Unlikely	Minor	Very low
	Property				
	Housing on-site	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Property				
	Adjacent housing estate (Calvert Green) (to the south-east)	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Adjacent housing (to the north-east)	Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low



Table 27: Post-Construction CSM and qualitative risk assessment – historical Buckingham Rural District Council refuse tip (Calvert Jubilee Nature Reserve) (Ref ID 13-9)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
<p>Historical council landfill recorded as having accepted industrial and commercial waste (now a lake and nature reserve)</p> <p>Contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)</p>	<p>Sensitive land use</p> <p>Adjacent housing (to the south-east)</p>	None (housing scheduled for demolition)	No contaminant linkage	No contaminant linkage	None
		Inhalation/ingestion of or dermal contact with contaminated soils/dust	No contaminant linkage	No contaminant linkage	None
		None (housing scheduled for demolition)			
		Inhalation of vapours derived from contaminated groundwater/soil	No contaminant linkage	No contaminant linkage	None
	<p>Ecological</p> <p>Calvert Jubilee LWS and nature reserve at Calvert Jubilee (on-site)</p>	None (housing scheduled for demolition)			
		Contaminated surface water within lake	Likely	Minor	Moderate/low
	<p>Property</p> <p>Adjacent housing (to the south-east)</p>	Contact with windblown dusts	Unlikely	Minor	Very low
		Lateral migration and concentration of asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
		Direct contact of below ground building structures and services with contaminated groundwater/soil	No contaminant linkage	No contaminant linkage	None

Table 28: Post-Construction CSM and qualitative risk assessment – historical Aylesbury Borough Council refuse tip (Ref ID 13-10)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Historical council landfill recorded to have accepted commercial waste (now Grebe Lake)  Contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Sensitive land use  On-site sailing club employees	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	Sensitive land use  Housing within 50m (to the south-east)	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Unlikely	Moderate	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
	Ecological  Calvert Brick Pits, Great Moor Sailing Club LWS (on-site)	Contaminated surface water within lake	Likely	Minor	Moderate/low
		Contact with windblown dusts	Unlikely	Minor	Very low
	Property  Housing within 50m (to the south-east)  On-site sailing club	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Moderate	Moderate/low
		Direct contact of below ground building structures and services with	Unlikely	Negligible	Very low

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
		contaminated groundwater/soil			

Table 29: Post Construction CSM and qualitative risk assessment –airfield (formerly RAF Finmere) (Ref ID 13-11)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Contaminants that could be present include, but are not limited to: fuels and oils, degreasants, paints, anti-freeze/de-icers (e.g. glycols), fire-fighting foams, cleaning agents, asbestos, explosives	Sensitive land use	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Moderate	Moderate/low
	Housing on-site (including farms)				
	Commercial premises on-site (including arable centre, animal feed mill and aerodrome)	Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
	Adjacent housing and commercial properties within 50m	Exposure to asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Controlled waters	Vertical and lateral migration of contaminated groundwater	Low likelihood	Minor	Low
	Largely unproductive strata at surface				
	Secondary A and undifferentiated glaciofluvial deposits and Kellaways Formation aquifers at surface in strip from centre of southern perimeter and south-western corner of Area ref 13-11				
	Ecological	Lateral migration of contaminated groundwater and surface run-off	Low likelihood	Minor	Low
	West Wood LWS (on-site)				

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
	Tingewick Meadows SSSI (partly on-site)	Contact with windblown dust	Low likelihood	Minor	Low
	Property Housing on-site (including farms) Commercial premises on-site (including arable centre, animal feed mill and aerodrome)	Lateral migration and concentration of asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Adjacent housing and commercial properties within 50m	Direct contact of below ground building structures and services with contaminated groundwater/soil	Low likelihood	Minor	Low

### 3.4 Assessment of temporary (construction) and permanent (post-construction) effects

Table 30: Significance of impact during construction and post construction – Calvert landfill Pits 4 and 5 (Ref ID 13-1)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
Inhalation/ingestion/dermal contact of contaminated soils/dusts by on-site employees	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/soil by on-site employees	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by on-site employees	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Inhalation/ingestion/dermal contact of contaminated soils/dusts by adjacent residents	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/soil by adjacent residents	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by adjacent residents	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Lateral migration of contaminated groundwater/leachate and surface run-off into Sheephouse Wood SSSI and Decoy Pond Wood LWS	Low	Low	Very Low	Negligible	Minor beneficial effect
Contact with windblown dusts in Sheephouse Wood SSSI and Decoy Pond Wood LWS	Low	Low	Low	Negligible	Negligible
Concentration of asphyxiative or explosive gases in on-site buildings	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Direct contact of below ground building structures and services on-site with contaminated groundwater/soil	Low	Low	Low	Negligible	Negligible
Lateral migration and concentration of asphyxiative or explosive gases in adjacent houses and sports ground building structures	Moderate	Moderate	Moderate	Negligible	Negligible
Direct contact of below ground building structures and	Very low	Very low	Very low	Negligible	Negligible

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
services adjacent with contaminated groundwater/soil					
Overall significance				Negligible	Negligible

Table 31: Significance of impact during construction and post construction – Aylesbury Link railway adjacent to the Proposed Scheme (Ref ID 13-2)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
Inhalation/ingestion/dermal contact of contaminated soils/dusts by adjacent landfill employees and residents	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/soil by adjacent landfill employees and residents	Low	Low	Low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by adjacent landfill employees and residents	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Lateral migration of contaminated groundwater/leachate and surface run-off into Sheephouse Wood SSSI, Decoy Pond Wood LWS, Calvert Jubilee LWS and nature reserve at Calvert Jubilee and Calvert Brick Pits and Great Moor Sailing Club LWS	Low	Low	Very low	Negligible	Minor beneficial effect
Contact with windblown dusts in Sheephouse Wood SSSI, Decoy Pond Wood LWS, Calvert Jubilee LWS and nature reserve at Calvert Jubilee and Calvert Brick Pits and Great Moor Sailing Club LWS	Very low	Very low	Very low	Negligible	Negligible
Lateral migration and concentration of asphyxiative or explosive gases in adjacent houses and Calvert landfill buildings	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Direct contact of below ground building structures and services adjacent with contaminated groundwater/soil	Very low	Very low	Very low	Negligible	Negligible
Overall significance				Negligible	Negligible

Table 32: Significance of impact during construction and post construction – former Calvert Brickworks (Ref ID 13-3)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
Inhalation/ingestion/dermal contact of contaminated soils/dusts by adjacent residents	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/soil by adjacent residents	Low	Low	Low	Negligible	Negligible
Direct contact of below ground building structures and services on-site and adjacent with contaminated groundwater/soil	Very low	Very low	Very low	Negligible	Negligible
Overall significance				Negligible	Negligible

Table 33: Significance of impact during construction and post construction – sewage works (Ref ID 13-6)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
Inhalation/ingestion/dermal contact of contaminated soils/dusts by on-site sewage work employees, and farm residents and workers within 50m	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/soil by on-site sewage work employees, and farm residents and workers within 50m	Low	Low	Low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by on-site sewage work employees, and farm residents and workers within 50m	Moderate	Moderate	Moderate	Negligible	Negligible
Vertical and lateral migration of contaminated groundwater to Secondary A River Terrace Deposits aquifer at surface	Low	Low	Low	Negligible	Negligible
Concentration of asphyxiative or explosive gases in on-site sewage works buildings and farm buildings within	Moderate	Moderate	Moderate	Negligible	Negligible

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
50m					
Direct contact of below ground building structures and services on-site and within 50m with contaminated groundwater/soil	Very low	Very low	Very low	Negligible	Negligible
Overall significance				Negligible	Negligible

Table 34: Significance of impact during construction and post construction – dismantled Rugby to Quainton Great Central Railway adjacent to the route (Ref ID 13-7)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
Inhalation/ingestion/dermal contact of contaminated soils/dusts by adjacent residents	Low	Low	Low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/soil by adjacent residents	Low	Low	Low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by adjacent residents	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Vertical and lateral migration of contaminated groundwater into the Secondary A aquifers at surface	Low	Low	Low	Negligible	Negligible
Surface run-off into Secondary A aquifers at surface	Low	Low	Low	Negligible	Negligible
Lateral migration of contaminated groundwater/leachate and surface run-off into Calvert Jubilee Nature LWS and Barton Hartshorn Railway Wood LWS	Low	Low	Low	Negligible	Negligible
Contact with windblown dusts in Calvert Jubilee Nature LWS and Barton Hartshorn Railway Wood LWS	Very low	Very low	Very low	Negligible	Negligible
Lateral migration and concentration of asphyxiative or explosive gases in adjacent farms	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Direct contact of adjacent below ground building structures and services with contaminated	Very low	Very low	Very low	Negligible	Negligible



Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
groundwater/soil					
Overall significance				Negligible	Negligible

Table 35: Significance of impact during construction and post construction – Calvert landfill Pit 1 (Ref ID 13-8)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
Inhalation/ingestion/dermal contact of contaminated soils/dusts by on-site residents	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/soil by on-site residents	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by on-site residents	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Inhalation/ingestion/dermal contact of contaminated soils/dusts by adjacent residents	Low	Low	Low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/soil by adjacent residents	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by adjacent residents	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Lateral migration of contaminated groundwater/leachate and surface run-off into Calvert Jubilee Nature LWS and Calvert Brick Pits and Great Moor Sailing Club LWS	Low	Low	Low	Negligible	Negligible
Contact with windblown dusts in Calvert Jubilee Nature LWS and Calvert Brick Pits and Great Moor Sailing Club LWS	Very low	Very low	Very low	Negligible	Negligible
Concentration of asphyxiative or explosive gases on-site houses	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Lateral migration and concentration of asphyxiative or	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
explosive gases in adjacent houses					
Direct contact of adjacent below ground building structures and services with contaminated groundwater/soil	Very low	Very low	Very low	Negligible	Negligible
Overall significance				Negligible	Negligible

Table 36: Significance of impact during construction and post construction – historical Buckingham Rural District Council refuse tip (Calvert Jubilee Nature Reserve) (Ref ID 13-9)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
Inhalation/ingestion/dermal contact of contaminated soils/dusts by adjacent residents	Low	None	None	Moderate beneficial effect	Moderate beneficial effect
Inhalation of vapours derived from contaminated groundwater/soil by adjacent residents	Moderate/low	None	None	Moderate beneficial effect	Moderate beneficial effect
Exposure to asphyxiative or explosive gases by adjacent residents	Moderate/low	None	None	Major beneficial effect	Major beneficial effect
Contaminated surface water within on-site lake (Calvert Jubilee Nature LWS)	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Contact with windblown dusts in Calvert Jubilee Nature LWS	Very low	Very low	Very low	Negligible	Negligible
Lateral migration and concentration of asphyxiative or explosive gases in adjacent houses	Moderate/low	None	None	Major beneficial effect	Major beneficial effect
Direct contact of adjacent below ground building structures and services with contaminated groundwater/soil	Very low	None	None	Minor beneficial effect	Minor beneficial effect
Overall significance				Negligible	Negligible

Table 37: Significance of impact during construction and post construction – historical Aylesbury Borough Council refuse tip (Ref ID 13-10)

<b>Contaminant linkage</b>	<b>Baseline risk</b>	<b>Construction risk</b>	<b>Post-construction risk</b>	<b>Construction effects</b>	<b>Post-construction effects</b>
Inhalation/ingestion/dermal contact of contaminated soils/dusts by on-site sailing club employees	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/soil by on-site sailing club employees	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by on-site sailing club employees	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Inhalation/ingestion/dermal contact of contaminated soils/dusts by adjacent residents	Low	Low	Low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/soil by adjacent residents	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by adjacent residents	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Contaminated surface water within on-site lake (Calvert Brick Pits and Great Moor Sailing Club LWS)	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Contact with windblown dusts in Calvert Brick Pits and Great Moor Sailing Club LWS	Very low	Very low	Very low	Negligible	Negligible
Lateral migration and concentration of asphyxiative or explosive gases in adjacent houses	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Direct contact of below ground building structures and services on-site and adjacent with contaminated groundwater/soil	Very low	Very low	Very low	Negligible	Negligible
Overall significance				Negligible	Negligible

## Appendix LQ-001-013

Table 38: Significance of impact during construction and post construction – airfield (formerly RAF Finmere) (Ref ID 13-11)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
Inhalation/ingestion/dermal contact of contaminated soils/dusts by on-site residents, commercial premises employees and properties within 50m	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/soil by on-site residents, commercial premises employees and properties within 50m	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by on-site residents, commercial premises employees and properties within 50m	None	None	None	Negligible	Negligible
Vertical and lateral migration of contaminated groundwater into the Secondary A and Secondary undifferentiated glaciofluvial deposits and Kellaways Formation aquifers at surface	Low	Low	Low	Negligible	Negligible
Lateral migration of contaminated groundwater and surface run-off into West Wood LWS and Tingewick Meadows SSSI on-site	Low	Low	Low	Negligible	Negligible
Contact with windblown dusts West Wood LWS and Tingewick Meadows SSSI on-site	Low	Low	Low	Negligible	Negligible
Concentration of asphyxiative or explosive gases in on-site residents, commercial premises users and properties within 50m	None	None	None	Negligible	Negligible
Direct contact of below ground building structures and services on-site and within 50m with contaminated groundwater/soil	Low	Low	Low	Negligible	Negligible
Overall significance				Negligible	Negligible

## 4 Inspections notes and other site data

4.1.1 This appendix presents site inspection notes for the key potentially contaminated sites at Calvert landfill visited during the study period. Key data is presented in Table 39 to Table 40.

This appendix also presents a summary of the ground investigation or contamination survey reports reviewed during the study period, presented in

4.1.2 Table 41. No other site data were obtained.

Table 39: Site inspection notes from Area ref 13-1

Inspection location (Land Parcel Ref: ON132809)	Details	
Area ref number	13-1	
Date of inspection	29 January 2013	
Site location	Calvert landfill Pits 4 and 5	
Site access	Private road	
Site description	Operational non-hazardous landfill	
Topography and surroundings - elevation in relation to surroundings, hummocks and breaks of slope	Rolling hills, surrounded by residential properties to the north, south and west of the site, with Sheephouse Wood SSSI to the east	
Neighbouring site use (in particular note any potentially contaminative activities or sensitive receptors)	north	Residential
	south	Residential
	east	Sheephouse Wood SSSI
	west	Residential
Site buildings - extent, size, type and usage. Boiler rooms, electrical switchgear	Portable elevated cabin, leachate treatment plant, warehouses and storage units, washing equipment, tools sheds and concrete pad car park	
Ground surfacing - type and condition	Concrete, and gravel pad in building area (<5% total site). Remainder of site active landfill	
Vegetation - evidence of distress, unusual growth or invasive species	No evidence of distress observed	
Evidence of ground contamination	None observed	
Services - evidence of buried services	None observed	

Table 40: Site inspection data from Area ref 13-8

Inspection location (Land Parcel Ref: ON132809)	Details	
Area ref number	13-8	
Date of inspection	29 January 2013	
Site location	Calvert landfill Pit 1	
Site access	Private road	
Site description	Non- operational non-hazardous landfill	
Topography and surroundings - elevation in relation to surroundings, hummocks and breaks of slope.	Rolling hills, surrounded by residential properties to the north, south and west of the site, with Sheephouse Wood SSSI to the east	
Neighbouring site use (in particular note any potentially contaminative activities or sensitive receptors)	north	Residential
	south	Residential
	east	Sheephouse Wood SSSI
	west	Residential
Site buildings - extent, size, type and usage. Boiler rooms, electrical switchgear	Portable elevated cabin, leachate treatment plant, warehouses and storage units, washing equipment, tools sheds and concrete pad car park	
Ground surfacing - type and condition	Concrete, and gravel pad in building area (<5% total site). Remainder of site active landfill	
Vegetation - evidence of distress, unusual growth or invasive species	No evidence of distress observed	
Evidence of ground contamination	None observed	
Services - evidence of buried services	None observed	

Table 41: Site relevant data - Ground investigation and contaminant survey reports

Local Authority Area	Report Title	Report Summary	Address of Area
Aylesbury Vale District Council	ENV_FCCEN_Calvert_Land fill_Gas_Data_2_Years.xlsx	Monthly borehole gas monitoring data from January 2010 to December 2012. Data includes atmospheric pressure, methane, carbon dioxide and VOC concentrations from 97 boreholes	Calvert landfill Pits 2 and 4
Aylesbury Vale District Council	ENV_FCCEN_Calvert_Land fill_Groundwater_Level_Data_2_Years.xlsx	Monthly groundwater borehole monitoring data from January 2010 to December 2012. Data includes depth to water and groundwater elevation from 20 boreholes	Calvert landfill Pits 2 and 4
Aylesbury Vale District Council	ENV_FCCEN_Calvert_Land fill_Groundwater_Quality_	Quarterly borehole monitoring data from January 2010 to December 2012.	Calvert landfill Pits 2 and 4

Local Authority Area	Report Title	Report Summary	Address of Area
	Data_2_Years.xlsx	Data is from 20 boreholes. Data includes alkalinity, ammoniacal nitrogen, cadmium, calcium, chloride, chromium, conductivity, copper, iron, lead, magnesium, manganese, mecoprop pesticide (MCP), mercury, nickel, pH, sodium, total sulphate, zinc, potassium, and toluene	

## **5 Geological sites of special scientific interest and local geological sites**

5.1.1 There are no geo-conservation resources identified within the study area.



## 6 Mining and minerals data

- 6.1.1 The Buckinghamshire Minerals and Waste Core Strategy development plan document<sup>2</sup>, confirms that the route will not pass through any MSA, mineral consultation areas or sites of current extraction.
- 6.1.2 A former clay pit and area of sand and gravel quarrying is shown to the south-west of the route at the southern end of the study area in the area now occupied by Calvert landfill, Grebe Lake, Calvert Jubilee LWS and nature reserve at Calvert Jubilee, and housing for the village of Calvert on Map LQ-01-029, centre point grid ref: I8, H7 and F8 in Volume 5, Land Quality Map Book.

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<sup>2</sup> Buckinghamshire County Council, (2011), *Minerals and Waste Core Strategy*, Adopted November 2012.

## 7 References

Buckinghamshire County Council, (2011), *Minerals and Waste Core Strategy*, Adopted November 2012.

Defra and Environment Agency, (2002), *Potential contaminants for the assessment of land - R&D Publication*, Bristol, Environment Agency.